DOCUMENT RESUME

ED 330 865 CE 057 663

TITLE	Drafting Lab Management Guide.
INSTITUTION	Ohio State Univ., Columbus. Instructional Materials Lab.
SPONS AGENCY	Ohio State Dept. of Education, Columbus. Div. of Vocational and Career Education.
PUB DATE	91
NOTE	92p.
AVAILABLE FROM	Instructional Materials Laboratory, Ohio State University, 842 West Goodale Blvd., Columbus, OH 43212 (order no. LMG-DR: $12.00).
PUB TYPE	Guides - Non-Classroom Use (055)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Competency Based Education; *Computer Assisted Design; Course Content; Course Organization; *Drafting; *Engineering Drawing; Laboratories; Laboratory Manuals; *Laboratory Procedures; *School Shops; Secondary Education; Trade and Industrial Education; Vocational Education

ABSTRACT

This manual was developed to guide drafting instructors and vocational supervisors in sequencing laboratory instruction and controlling the flow of work for a 2-year machine trades training program. The first part of the guide provides information on program management (program description, safety concerns, academic issues, implementation strategies, and evaluation strategies), lifetime skills, entrepreneurship skills, a list of items needed for student tool kits, the drafting laboratory and consumable items, lists of units of instruction for conventional or computer-aided drafting programs, and a competency list for a conventional drafting program. Following sections contain information on organization of the 2 years of the program and outlines of 11 units for junior year and 12 units for senior year. Each unit includes time allotted, lab status, number of new competencies, instructional objective, list of competencies, equipment, tools, materials, and supplies; and suggested management and evaluation strategies. The junior year units cover the following topics: developing professional behavior; developing basic lab skills; drawing geometric projections; creating orthographic projections; dimensioning; sectioning; developing and reinforcing competencies; drawing pictorials; drawing intersections and developments; developing basic computer-aided design skills; and developing and reinforcing competencies. Senior units cover reviewing junior year; developing intermediate computer-aided design skills; preparing machine drawings; developing and reinforcing competencies; preparing architectural drawings; preparing structural drawings; developing and reinforcing competencies; mapping; surveying; preparing electrical and electronic drawings; and developing and reinforcing competencies. An appendix provides drafting laboratory progress charts for recording student competencies. (KC)

ED330865

DRAFTING
LAB MANAGEMENT GUIDE

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

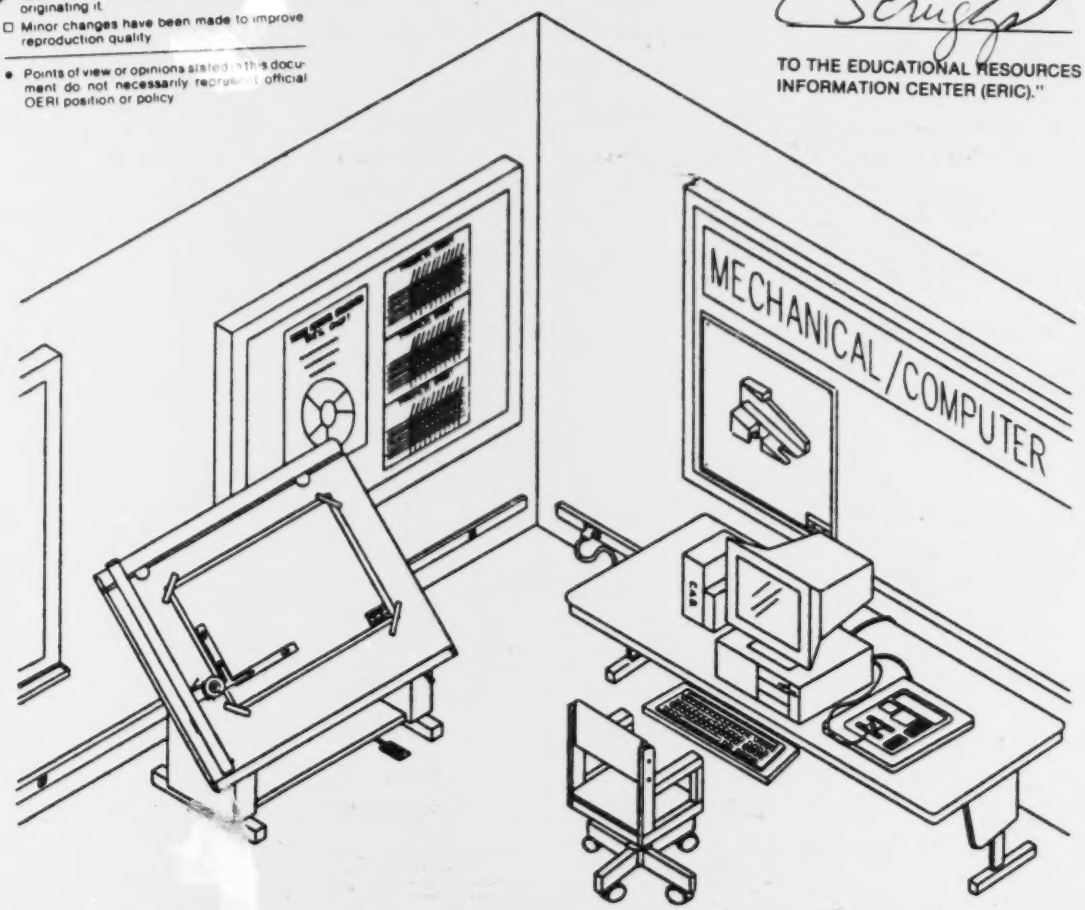
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

C Scruggs

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."



BEST COPY AVAILABLE

CE 057663

DRAFTING
LAB MANAGEMENT GUIDE

Vocational Instructional Materials Laboratory
The Ohio State University
Columbus, Ohio

1991

Copyright 1991 by the Vocational Instructional Materials Laboratory, The Ohio State University. All rights reserved.

This publication was supported in part or in whole by federal funds of P.L. 98-524, through the Division of Vocational and Career Education, the Ohio Department of Education. Compliance is assured with the Carl D. Perkins Vocational Education Act of 1984, Title IX of the Education Amendments of 1972, Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, and the Ohio State Plan for Vocational Education. This publication does not necessarily reflect the official position of the U.S. Department of Education.

CONTENTS

FOREWORD iii

PROGRAM MANAGEMENT 1

- Program Description 1
- Safety Concerns 1
- Academic Issues 1
- Implementation Strategies 2
- Evaluation Strategies 3

LIFETIME SKILLS 5

ENTREPRENEURSHIP SKILLS 7

DEFINITIONS 11

SUGGESTED ITEMS FOR THE STUDENT TOOL KIT 13

SUGGESTED EQUIPMENT FOR THE DRAFTING LAB 15

SUGGESTED CONSUMABLE SUPPLIES FOR THE DRAFTING LAB 17

UNITS OF INSTRUCTION FOR A CONVENTIONAL DRAFTING PROGRAM 19

UNITS OF INSTRUCTION FOR A COMPUTER AIDED DRAFTING PROGRAM 21

COMPETENCY LIST FOR A CONVENTIONAL DRAFTING PROGRAM 23

DRAFTING LAB - JUNIOR YEAR 29

ORGANIZATIONAL CHART - JUNIOR YEAR 31

LAB INSTRUCTIONAL GROUP I: DEVELOPING PROFESSIONAL BEHAVIOR 33

LAB INSTRUCTIONAL GROUP II: DEVELOPING BASIC LAB SKILLS 35

LAB INSTRUCTIONAL GROUP III: DRAWING GEOMETRIC PROJECTIONS 37

LAB INSTRUCTIONAL GROUP IV: CREATING ORTHOGRAPHIC PROJECTIONS 39

LAB INSTRUCTIONAL GROUP V: DIMENSIONING 41

LAB INSTRUCTIONAL GROUP VI: SECTIONING 43

LAB INSTRUCTIONAL GROUP VII: DEVELOPING AND REINFORCING COMPETENCIES 45

LAB INSTRUCTIONAL GROUP VIII: DRAWING PICTORIALS 47

LAB INSTRUCTIONAL GROUP IX: DRAWING INTERSECTIONS AND DEVELOPMENTS 49

LAB INSTRUCTIONAL GROUP X: DEVELOPING BASIC CAD SKILLS 51

LAB INSTRUCTIONAL GROUP XI: DEVELOPING AND REINFORCING COMPETENCIES 53

DRAFTING LAB - SENIOR YEAR 55

ORGANIZATIONAL CHART - SENIOR YEAR 57

LAB INSTRUCTIONAL GROUP XII: REVIEWING JUNIOR YEAR 59

LAB INSTRUCTIONAL GROUP XIII: DEVELOPING INTERMEDIATE CAD SKILLS 61

LAB INSTRUCTIONAL GROUP XIV: PREPARING MACHINE DRAWINGS 63

LAB INSTRUCTIONAL GROUP XV: DEVELOPING AND REINFORCING COMPETENCIES 65

LAB INSTRUCTIONAL GROUP XVI: PREPARING ARCHITECTURAL DRAWINGS 67

LAB INSTRUCTIONAL GROUP XVII: DEVELOPING AND REINFORCING COMPETENCIES 69

LAB INSTRUCTIONAL GROUP XVIII: PREPARING STRUCTURAL DRAWINGS 71

LAB INSTRUCTIONAL GROUP XIX: DEVELOPING AND REINFORCING COMPETENCIES 73

LAB INSTRUCTIONAL GROUP XX: MAPPING 75

LAB INSTRUCTIONAL GROUP XXI: SURVEYING 77

LAB INSTRUCTIONAL GROUP XXII: PREPARING ELECTRICAL AND ELECTRONIC DRAWINGS 79

LAB INSTRUCTIONAL GROUP XXIII: DEVELOPING AND REINFORCING COMPETENCIES 81

APPENDIX 83

Appendix A. DRAFTING LAB PROGRESS CHART, INSTRUCTIONAL GROUP II: DEVELOPING BASIC LAB SKILLS 85

Appendix B. DRAFTING LAB PROGRESS CHART, INSTRUCTIONAL GROUP III: DRAWING GEOMETRIC CONSTRUCTIONS 87

Appendix C. DRAFTING LAB PROGRESS CHART (Blank) 89

FOREWORD

The purpose of this manual is to guide drafting instructors and vocational supervisors in sequencing manipulative instruction and controlling the flow of production work for a two-year drafting training program.

This document is intended to serve as a reference for organizing lab activities; it is not a course of study or a full curriculum guide.

Recognition for the development of this document is due to the following contributors:

The Authors

Ms. Kimberly Beasley, Drafting, Instructor, Vocational Education Department Lima Correctional Facility, Lima, Ohio

Mr. Charles Hancock, Drafting Instructor, Licking County Joint Vocational School, Newark, Ohio

Mr. Craig Kellett, Drafting Instructor, Eastland Career Center, Groveport, Ohio

Mr. Jerry Spencer, Drafting Instructor, Sentinel Vocational Center, Tiffin, Ohio

Ms. Linda Thayer, Drafting Instructor, East Liverpool High School, East Liverpool, Ohio

Mr. Don Yetzer, Drafting Instructor, Colerain Vocational Center, Cincinnati, Ohio

The Technical Advisors

Ms. Debbie Peterson, CAD Consultant, Technical Software Company, Cleveland, Ohio

Mr. Donald Weaver, President, Mid-West Structures, Inc., Heath, Ohio

The Project Consultants

Ms. Tommie Basinger, T & I State Supervisor, Ohio Department of Education, Columbus, Ohio

Dr. Thomas Hyde, Retired T & I State Supervisor, Ohio Department of Education, Columbus, Ohio

Mr. Richard Price, T & I Teacher Educator, The Ohio State University, Columbus, Ohio

Dr. Theodore Shannon, T & I/Health Occupations Curriculum Consultant, The Ohio State University, Columbus, Ohio

This document was word processed by Ms. Sandy Rees of the Vocational Instructional Materials Laboratory.

PROGRAM MANAGEMENT

Program Description

1. The *Drafting Lab Management Guide* is designed for reference in planning and conducting a three-hour lab throughout the junior and senior years. Related technical information is to be presented in addition to the scheduled lab activities.

2. This program is designed to be flexible, enabling the drafting instructor(s) and program supervisor to alter the selection sequence and the time schedule in order to meet the individual needs of local industry, the school, the community, and the students.

3. This program is organized to teach the competencies required in an entry-level drafting job.

Safety Concerns

1. The instructor(s) must teach safety daily and demand strict adherence to all safety regulations at all times. The instructor(s), all students, and all visitors must wear safety glasses and ear plugs whenever such devices are called for in the lab or at field sites.

2. It is essential that the instructor(s) document instruction given to individual students on safety, develop a safe-practices evaluation, and file these documents for future reference.

3. Drafting instructor(s) should dispose of hazardous wastes in accordance with federal and state guidelines.

Academic Issues

1. Duly certified teachers must teach applied mathematics, science, and communication skills. Academic credit will be assigned through Program Options or through "Principles of Technology."

2. Computer competencies or training should be available to all students.

3. Blueprint reading should be introduced into each instructional group where applicable in both the junior and senior years.

4. Lifetime skills should be taught in the related classroom and practiced in the laboratory throughout the entire junior and senior years of the drafting program. Lifetime skills are defined as nontechnical competencies necessary for students to operate successfully in the business world.

5. The instructor(s) should consider incorporating activities that demonstrate entrepreneurship concepts. Business-related concepts may be discussed in the related classroom lessons.

6. The class must participate in the student organization Vocational Industrial Clubs of America (VICA) and in its sponsored competition and leadership activities. Instructor(s) should encourage participation and the program supervisor and the school administrators should support the program.

7. The drafting instructor(s) must organize a craft advisory committee and meet regularly with the committee throughout the school year. Advisory committee members can speak to classes, judge competitions, supply needed items, host field trips, employ program graduates, advise instructors regarding program policy, and review curriculum.

8. The instructor(s) should regularly attend professional and technical development conferences to remain competent in the drafting field, and should belong to the American Vocational Association, the state vocational association, and other appropriate professional associations and societies.

Implementation Strategies

1. At the beginning of each instructional group the instructor(s) must consider each student's skill level and the available time and supplies and then decide on appropriate demonstrations.

2. For each special needs student requiring individualized instruction and consideration the instructor(s) should select appropriate competencies from the course outline and should include these competencies in the Individualized Educational Plan (IEP).

3. The instructor(s) should require students to demonstrate and practice shop management competencies throughout the two-year program.

4. The instructor(s) must keep student progress charts up to date during this sequenced program.

5. No more than two students should be assigned to each drafting work station. Whenever possible one student should be assigned to one table.

6. The instructor(s) should design and administer rotation schedules whenever necessary to route all students equally through the competencies within a given time period.

7. A student rotation schedule will be necessary for those programs that have less than one computer per student. To determine a daily rotation schedule, the instructor(s) should divide the number of students by the number of stations.

8. The equipment list for this program indicates minimum requirements. The instructor(s) should add more equipment as needed, depending upon advisory committee input, local needs, equipment availability, and the number of students enrolled in the class.

9. The lab should include a materials management program to maximize materials usage, minimize waste, and provide adequate storage.

10. To familiarize students with actual job conditions, the instructor(s) should incorporate field trips periodically throughout the junior and senior years.

11. Early placement of students at job sites may take place during the time period specified by school regulations. The instructor(s) and the cooperative employers must agree upon individualized training plans that will ensure consistency with in-school drafting instruction.

Evaluation Strategies

1. Students' drafting competencies should meet accepted industry standards.

2. A series of lab evaluations should be conducted during key times to determine each student's eligibility for advancement or the necessity for retraining in various areas.

3. After the instructor(s) have presented a competency the students should be evaluated on the practice of the skill throughout the remainder of the program.

4. A comprehensive competency profile that itemizes drafting competencies should be issued to each student who completes the two-year program.

LIFETIME SKILLS

The student will learn to do the following:

1. Work effectively under different kinds of supervision.
2. Work without the need for close supervision.
3. Be on time for activities and appointments.
4. Work effectively when time and pressure are critical factors for success.
5. Be responsible for the effects of his or her own judgment and actions.
6. Plan, conduct, and complete activities on his or her own initiative.
7. Work cooperatively as a team member.
8. Work effectively with people of different personalities.
9. Coordinate his or her activities with those of others.
10. Instruct or direct someone in the performance of a specific task.
11. Demonstrate how to perform a specific task.
12. Assign others to carry out specific tasks.
13. Identify the existence of a problem, given a specific set of facts.
14. Ask appropriate questions to identify or verify the existence of a problem.
15. List the possible causes of a problem.
16. Identify important information needed to solve a problem.
17. Generate possible alternative solutions to a problem.

Source: adapted from F.C. Pratzner and J.F. Russell. The Changing Workplace: Implications for Quality of Work Life Developments for Vocational Education (Columbus, Ohio: National Center for Research in Vocational Education, 1984), pp. 55-57.

18. Describe the application and likely consequences of alternative solutions.

19. Estimate the potential likelihood of an occurrence and the probable sequence of events.

20. Use appropriate processes in order to make a decision.

21. Prioritize several tasks.

22. Determine the step-by-step process by which a specific task may be accomplished.

23. Estimate the time required to accomplish a specific task.

24. Select materials and resources needed to perform a specific task.

25. Gather information or data from books, manuals, and other printed documents.

26. Speak fluently and effectively with both individuals and groups.

27. Listen carefully and take accurate notes from spoken communication.

28. Use previously learned knowledge and skills in a new situation.

29. Learn to recall ideas, facts, and information accurately.

30. Clearly state and defend a position.

31. Estimate profit.

32. Make cost-saving suggestions.

33. Understand such concepts as power, control, authority, and delegation.

34. Define specifications, defects, tolerances, control limits, inspection, and quality control.

ENTREPRENEURSHIP SKILLS

1. Understanding the Nature of Small Business

   a. Define the role of small business in the U.S. economy.
   b. Analyze factors that contribute to small business success.

2. Determining Your Potential as an Entrepreneur

   a. Identify the personal characteristics of entrepreneurs.
   b. Evaluate your potential for starting a business.

3. Developing the Business Plan

   a. Describe a business plan's contents
   b. Recognize the importance of a well-designed business plan.

4. Obtaining Technical Assistance

   a. Recognize the importance of obtaining technical assistance.
   b. Determine the type of technical assistance needed by a new business.

5. Choosing the Type of Ownership

   a. Describe advantages and disadvantages of business ownership types.
   b. Analyze factors influencing the choice of ownership type.

6. Planning the Market Strategy

   a. Explain the importance of marketing activities for business success.
   b. Define a marketing plan's components and purpose.

7. Locating the Business

   a. Examine factors in selecting a good business site.
   b. Outline the steps for selecting the correct business site.

Source: adapted from Ashmore, M. Catherine, et al. New Directions for Vocational Education. Columbus, Ohio: The National Center for Research in Vocational Education, 1986, pp. 19-21.

8. Financing the Business

   a. Recognize factors to consider in obtaining finances for a new business.
   b. Determine information needed to obtain financing from different sources.

9. Dealing With Legal Issues

   a. Explain uses of contracts in small business.
   b. Define legal issues encountered by entrepreneurs.

10. Complying With Government Regulations

   a. Explain how different types of legislation affect and protect small business.
   b. Determine government regulations, licenses, and permits affecting small business start-up.

11. Managing the Business

   a. Recognize the importance of sound management techniques to business success.
   b. Identify specific management techniques entrepreneurs use.

12. Managing Human Resources

   a. Explain the responsibilities involved in managing human resources.
   b. Identify techniques that may be used to manage human resources.

13. Promoting the Business

   a. Describe methods of promotion small businesses use.
   b. Analyze techniques and cost factors in small business promotional planning.

14. Managing Sales Efforts

   a. Outline what successful salespeople in a small business need to know.
   b. Analyze selling strategies appropriate to various types of businesses.

15. Keeping the Business Records

   a. Describe the components of a sound record-keeping system.
   b. Identify the type of financial data obtained from business records.

16. Managing the Finances

    a. Identify the various financial statements and ratios businesses use to manage finances.
    b. Describe the components and construction of various financial statements.

17. Managing Customer Credit and Collection

    a. Explain factors to consider in small business credit and collections.
    b. Describe the management of customer credit and collections.

18. Protecting the Business

    a. Identify the types of risks faced by entrepreneurs.
    b. Describe precautions to take against threats to the business.

DEFINITIONS

Advisory Committee - An appointed group of representatives from the local drafting industry that meets at least twice a year

AISC - American Institute of Steel Construction

ANSI - American National Standards Institute

CAD - Computer Aided Drafting

CAD Drawing Set-up - Determination of drawing perimeters, e.g. size, coordinates, and scale

CAD Work Station - A computer work station for one student that includes all necessary hardware and software to produce drawings, e.g., computer, monitor, software, and digitizer

CAM - Computer Aided Manufacturing

Closed Laboratory - A time period in which competencies are developed in simulated conditions and no outside jobs are scheduled

Digitizer - CAD input device

Drafting Media - The material used for conveyance of information, e.g. paper, vellum, and film

Drafting Station - A work station for one student that includes table, chair, and drafting equipment

Drawing File - A portion of a disk dedicated to storing drawings

Entity - A combination of lines, arcs, circles, and points developed on a computer screen

HVAC - Heating, ventilation, and air conditioning

Industrial Standards - Criteria used by local industry and supported by advisory committees, e.g., ANSI, AISC, and one- and two-family dwelling codes

Input Device - Any device used to enter data into a computer, e.g. digitizer, keyboard, and mouse

Open Laboratory - A time period in which previously taught competencies may be performed on jobs scheduled through the instructor

Output Device - Any device used to record final copy

Progress Chart - A list of student tasks to be marked as completed

Rotation - A student work schedule that permits equal time for practicing tasks on the available number of work stations

Semi-open Laboratory - A time period in which previously taught competencies will be developed in simulated conditions and a limited number of outside jobs may be scheduled through the instructor

Simulated Condition - A realistic situation created within the confines of the school laboratory that is representative of typical jobs performed in an actual work setting

VICA - Vocational Industrial Clubs of America

SUGGESTED ITEMS FOR THE STUDENT TOOL KIT

This list of tools may be modified to meet the requirements of the curriculum and advisory committee recommendations.

1. Calculator, scientific
2. Carrying case for tools
3. Compass adapter
4. Drafting tape
5. Drawing compass set (large compass with a beam, small compass, and dividers)
6. Dusting brush
7. Erasers, film
8. Eraser, vellum
9. Erasing shield
10. Floppy disks (two)
11. Irregular curve(s)
12. Lead holders (three) and/or .3mm, .5mm, and .7mm mechanical
13. Lead pointer for lead holders
14. Lettering guide
15. Mechanical pencils, .3mm, .5mm, and .7mm
16. Point cleaners for lead pointer
17. Protractor
18. Sandpaper pad or file
19. Scales, architect's
20. Scales, engineer's
21. Scales, mechanical
22. Scales, metric
23. Template(s), architectural

24. Template(s), circle

25. Template(s), ellipse

26. Triangle, adjustable

27. Triangle, 45

28. Triangle, 30 /60

29. Two-pen inking kit

NOTE: It is highly recommended that students also be encouraged to purchase a VICA Leadership Handbook at the time they are making tool purchases.

SUGGESTED EQUIPMENT FOR THE DRAFTING LAB

Item	Quantity
Application software - (architectural, mechanical, CAM, structural, civil, lettering, etc.)	As required
Bookcase for drafting library (at least 30 linear feet recommended)	1
Bulletin board (at least 4' x 10')	1 or 2
Cabling	As required
CAD computers having industrial-standard CAD systems with appropriate operating speed, storage capacity, memory capabilities, hardware flexibility, and expandability	20
CAM-driven device, robot, lathe, or mill	As recommended by advisory committee
Chairs designed for computer tables	20
Chalkboard (10' minimum length)	1
Computer covers	20
Computer tables or computer stands	20
Covers for drafting board (green recommended)	20
Disk storage unit	1
Drafting boards, adjustable 36" x 48" minimum top size	20
Drafting chairs, swivel-type, adjustable	20
Drafting machines with scales or 48" minimum parallel bars	20
Drawing copy machine (36" wide)	1
Drawing storage unit	1
File cabinet, four drawers	2
General drawing storage drawers	10

High-resolution color monitors with screens as large as possible	20
Input devices	20
Light table	1
Measuring instruments (micrometers, vernier calipers, etc) as required by program	10
Mechanical lettering sets	5
Modem communications capability	As recommended by advisory committee
Monitor viewing system for instruction	1
Multipen drawing plotter - "D" size minimum	1
Overhead projector	1
Overhead screen	1
Paper cutter (24" sq or 36" sq)	1
Printer	1
Reference tables	20
Software professional quality packages	20
Storage cabinet for consumable supplies	1
Storage cabinet for drawing media	1
Storage cabinet for general items	1
Storage drawers for drawing	20
Surveying instrument sets	2
Switch boxes or buffers for plotting and printing	As Required
Work table (6' minimum length)	1

SUGGESTED CONSUMABLE SUPPLIES FOR THE DRAFTING LAB

Item	Type	Quantity
Blueprint or copy paper	A	500 sheets
	B	2000 sheets
	C	2000 sheets
	D	500 sheets
		2 rolls 36" x 50 yd
Film drawing media	A	100 sheets
	B	500 sheets
	C	500 sheets
	D	100 sheets
		1 roll 36" x 50 yd
Floppy disks	20	
Ink	manual	24 oz
	plotter	24 oz
Plotter paper	B	1000 sheets
	C	1500 sheets
	D	1500 sheets
Plotter pens	50	
Sketching media	8-1/2" x 11"	500 sheets
	11" x 17"	500 sheets
Vellum drawing media	A	500 sheets
	B	2000 sheets
	C	2000 sheets
	D	500 sheets
		1 roll 36" x 50 yd

UNITS OF INSTRUCTION FOR A CONVENTIONAL DRAFTING PROGRAM

UNIT A Developing Professional Behavior

UNIT B Developing Basic Lab Skills

UNIT C Drawing Geometric Constructions

UNIT D Creating Orthographic Projections

UNIT E Dimensioning

UNIT F Sectioning

UNIT G Drawing Pictorials

UNIT H Drawing Intersections and Developments

UNIT I Developing Basic CAD Skills

UNIT J Developing Intermediate CAD Skills

UNIT K Preparing Machine Drawings

UNIT L Preparing Architectural Drawings

UNIT M Preparing Structural Drawings

UNIT N Mapping

UNIT O Surveying

UNIT P Preparing Electrical and Electronic Drawings

UNITS OF INSTRUCTION FOR A COMPUTER AIDED DRAFTING PROGRAM

The following duty list is provided for programs that are considering a totally computerized curriculum. Many of the duties shown may be grouped and presented as a blueprint reading course or a basic computer program. Duty B, Developing Basic Lab Skills, provides an opportunity for students to develop the minimal manual drafting skills that may be required by some companies. Instructors should consider retaining some drafting stations for these needs.

UNIT A Developing Professional Behavior

UNIT B Developing Basic Lab Skills

UNIT C Developing Computer Drafting Skills

UNIT D Drawing Geometric Constructions

UNIT E Creating Orthographic Projections

UNIT F Dimensioning

UNIT G Sectioning

UNIT H Drawing Pictorials

UNIT I Drawing Intersections and Developments

UNIT J Preparing Machine Drawings

UNIT K Preparing Architectural Drawings

UNIT L Preparing Structural Drawings

UNIT M Mapping

UNIT N Surveying

UNIT O Preparing Electrical and Electronic Drawings

UNIT P Programming Computer Aided Manufacturing

COMPETENCY LIST FOR CONVENTIONAL DRAFTING PROGRAM

UNIT A Developing Professional Behavior

A.1 Apply for a position in the lab personnel organization system.

A.2 Demonstrate assimilation of lab conduct rules.

A.3 Practice leadership qualities.

A.4 Dress according to the established code.

A.5 Maintain a personal progress chart.

A.6 Demonstrate social interaction skills.

A.7 Arrive in the lab on time every day.

A.8 Start all work assignments promptly.

A.9 Complete work projects on or ahead of schedule.

A.10 Demonstrate safety awareness in all lab endeavors.

A.11 Demonstrate the qualities of honesty, reliability, trustworthiness, and cooperation at all times.

A.12 Display a positive attitude.

A.13 Investigate VICA opportunities.

UNIT B Developing Basic Lab Skills

B.1 Demonstrate the ability to use equipment and supplies.

B.2 Reproduce drawings.

B.3 Execute lettering.

B.4 Execute line technique.

B.5 Draw borders and title block formats.

UNIT C Drawing Geometric Constructions

C.1 Draw straight lines.

C.2 Construct angles.

C.3 Construct plane figures.

C.4 Construct circles and arcs.

C.5 Construct irregular figures.

UNIT D Creating Orthographic Projections

D.1 Sketch orthographic views.

D.2 Draw multiview projections.

D.3 Draw auxiliary views.

D.4 Draw revolutions.

D.5 Draw descriptive geometry problems.

UNIT E Dimensioning

E.1 Specify dimensions.

E.2 Execute tolerances.

E.3 Apply geometric tolerances.

UNIT F Sectioning

F.1 Draw standard sections.

F.2 Draw special sections.

F.3 Draw conventional breaks.

UNIT G Drawing Pictorials

G.1 Create axonometric projections.

G.2 Create oblique drawings.

G.3 Create perspective drawings.

G.4 Draw exploded assemblies.

UNIT H Drawing Intersections and Developments

H.1 Construct development drawings.

H.2 Construct transition drawings.

H.3 Draw intersections.

H.4 Draw welding symbols.

H.5 Construct development models.

UNIT I Developing Basic CAD Skills

I.1 Review computer program start-up procedures.

I.2 Format disk.

I.3 Copy files.

I.4 Erase files.

I.5 Change directory.

I.6 Rename files.

I.7 Set drawing parameters.

I.8 Create drawing entities.

I.9 Edit drawing entities.

I.10 Control viewing.

I.11 Use drawing aids.

I.12 Save drawing files.

I.13 Plot or print a drawing.

UNIT J Developing Intermediate CAD Skills

J.1 Develop symbols.

J.2 Develop symbol libraries.

J.3 Manage and control symbols, layers, and line types.

J.4 Manage an operating system.

J.5 Develop drawings requiring intermediate CAD functions.

J.6 Develop attributes.

J.7 Use third party software.

J.8 Use Macro Lisp capabilities.

J.9 Develop three dimensional drawings.

UNIT K Preparing Machine Drawings

K.1 Apply tolerances and fits.

K.2 Apply geometric tolerances.

K.3 Draw assemblies.

K.4 Check drawing.

K.5 Draw fasteners.

K.6 Develop fluid power drawings.

K.7 Develop layouts.

K.8 Develop cam and gear drawings.

UNIT L Preparing Architectural Drawings

L.1 Draw a floor plan.

L.2 Draw a plot plan.

L.3 Draw a foundation plan.

L.4 Draw elevations.

L.5 Develop schedules.

L.6 Draw sections and details.

L.7 Draw a roof plan.

L.8 Draw an electrical plan.

L.9 Draw HVAC plan.

L.10 Draw a plumbing plan.

L.11 Write specifications.

UNIT M Preparing Structural Drawings

M.1 Draw structural steel shapes.

M.2 Draw structural connections.

M.3 Draw erection plans.

M.4 Draw structural details.

UNIT N Mapping

N.1 Draw topographic maps.

N.2 Draw mapping symbols.

N.3 Draw mapping profiles.

N.4 Draw site plans.

UNIT O Surveying

O.1 Gather data, information, and drawings from county mapping department.

O.2 Set up a transit.

O.3 Operate a transit.

O.4 Shoot boundary lines.

O.5 Make a sketch and take field notes.

O.6 Generate a completed survey drawing.

UNIT P Preparing Electrical and Electronic Drawings

P.1 Draw pictorial diagrams.

P.2 Draw connection diagrams.

P.3 Draw schematic diagrams.

P.4 Draw printed circuit (PC) drawings.

P.5 Draw block and logic diagrams.

DRAFTING LAB - JUNIOR YEAR

ORGANIZATIONAL CHART - JUNIOR YEAR

INSTRUCTIONAL GROUP NO.	NO. OF WEEKS	INSTRUCTIONAL GROUP TITLE	NO. OF COMPETENCIES	LAB STATUS
I	1	DEVELOPING PROFESSIONAL BEHAVIOR	13	CLOSED
II	1	DEVELOPING BASIC LAB SKILLS	5	CLOSED
III	3	DRAWING GEOMETRIC CONSTRUCTIONS	5	CLOSED
IV	6	CREATING ORTHOGRAPHIC PROJECTIONS	5	CLOSED
V	6	DIMENSIONING	3	CLOSED
VI	3	SECTIONING	3	CLOSED
VII	2	DEVELOPING AND REINFORCING COMPETENCIES	0	SEMI-OPEN
VIII	4	DRAWING PICTORIALS	4	CLOSED
IX	3	DRAWING INTERSECTIONS & DEVELOPMENTS	5	CLOSED
X	5	DEVELOPING BASIC CAD SKILLS	13	CLOSED
XI	2	DEVELOPING AND REINFORCING COMPETENCIES	0	SEMI-OPEN

LAB INSTRUCTIONAL GROUP I: DEVELOPING PROFESSIONAL BEHAVIOR

Time Allotted: 1 week

Lab Status: Closed

Number of New Competencies: 13

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will become acclimated to the drafting program and to the opportunities in the drafting industry.

Competencies Demonstrated and Practiced in This Lab Instructional Group

A-1. Apply for a position in the lab personnel organization system.

A-2. Demonstrate assimilation of lab conduct rules.

A-3. Practice leadership qualities.

A-4. Dress according to the established code.

A-5. Maintain a personal progress chart.

A-6. Demonstrate social interaction skills.

A-7. Arrive in the lab on time every day.

A-8. Start all work assignments promptly.

A-9. Complete work projects on or ahead of schedule.

A-10. Demonstrate safety awareness in all lab endeavors.

A-11. Demonstrate the qualities of honesty, reliability, trustworthiness, and cooperation at all times.

A-12. Display a positive attitude.

A-13. Investigate VICA opportunities.

Suggested Resources and AV Equipment

1. VICA Handbook
2. Guest lecturers
3. Relevant pamphlets, filmstrips, slides, films, video, cassettes
4. Advisory committee

Suggested Management Strategies

1. Enlist the help of the advisory committee to select key competencies based on drafting industry rules of conduct.
2. Attend VICA advisory training workshops and encourage student participation in VICA.
3. Serve as a quality role model at all times.
4. Require students to keep all work areas clean and organized and follow demonstrated safety practices.
5. Provide a list of safety guidelines.
6. Design a personnel management plan that ensures an equal opportunity for all students to participate.
7. List competencies on a chart and check off each student's progress.

Evaluation Strategies

1. Test for safety knowledge.
2. Observe for safe practices.
3. Maintain student progress chart.
4. Observe students practicing competencies.

LAB INSTRUCTIONAL GROUP II: DEVELOPING BASIC LAB SKILLS

Time Allotted: 1 week

Lab Status: Closed

Number of New Competencies: 5

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will use basic lab items; letter; and draw lines, borders, and title-block formats per ANSI standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

B-1. Demonstrate the ability to use equipment and supplies.

B-2. Reproduce drawings.

B-3. Execute lettering.

B-4. Execute line technique.

B-5. Draw borders and title block formats.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI Drafting Standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed assignments per ANSI Standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP III: DRAWING GEOMETRIC CONSTRUCTIONS

Time Allotted: 3 weeks

Lab Status: Closed

Number of New Competencies: 5

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will perform geometric constructions involving straight lines, angles, plane figures, circles, arcs, and irregular figures. All work will meet drafting standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

C-1. Draw straight lines.

C-2. Construct angles.

C-3. Construct plane figures.

C-4. Construct circles and arcs.

C-5. Construct irregular figures.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lesson immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

Evaluation Strategies

1. Observe safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed assignments per ANSI standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP IV: CREATING ORTHOGRAPHIC PROJECTIONS

Time Allotted: 6 weeks

Lab Status: Closed

Number of New Competencies: 5

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will demonstrate the ability to select views and, using proper line weights, to create orthographic sketches and drawings involving auxiliary and revolved views. Additionally, the student will demonstrate the ability to create drawings showing true lengths of lines, true shapes of planes, and intersections of lines and planes. All work will meet ANSI standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

D-1. Sketch orthographic views.

D-2. Draw multiview projections.

D-3. Draw auxiliary views.

D-4. Draw revolutions.

D-5. Draw descriptive geometry problems.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD Station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts and drawings
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain a student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed job assignments per ANSI standards.

5. Evaluate completed job assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP V: DIMENSIONING

Time Allotted: 6 weeks

Lab Status: Closed

Number of New Competencies: 3

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will demonstrate the ability to use standard and geometric tolerancing methods to apply dimensions, notes, and tolerances to drawings according to ANSI standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

E-1. Specify dimensions

E-2. Execute tolerances

E-3. Apply geometric tolerances

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed assignments per ANSI standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP VI: SECTIONING

Time Allotted: 3 weeks

Lab Status: Closed

Number of New Competencies: 3

Instructional Group Objectives: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will draw standard sections, special sections, and conventional breaks that meet drafting standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

F-1. Draw standard sections.

F-2. Draw special sections.

F-3. Draw conventional breaks.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.
2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before submitting a drawing and a corrected copy for grading.

5. List each competency on a progress chart for check-off upon successful completion by each student.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed assignments per ANSI standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP VII: DEVELOPING AND REINFORCING COMPETENCIES

Time Allotted: 2 weeks

Lab Status: Semi-open

Number of New Competencies: 0

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will use basic lab skills, orthographic projections, sectioning, and dimensioning to produce working drawings that meet ANSI standards.

Competencies Demonstrated and Practiced in This Lab Instruction Group

All competencies from Instructional Groups I through VI.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.
2. Demonstrate competencies to students before they begin their assignments.
3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.
4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed assignments per ANSI standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP VIII: DRAWING PICTORIALS

Time Allotted: 4 weeks

Lab Status: Closed

Number of New Competencies: 4

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will select the most characteristic views, and create axonometric, oblique, and perspective drawings and exploded assemblies according to ANSI standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

G-1. Create axonometric projections.

G-2. Create oblique drawings.

G-3. Create perspective drawings.

G-4. Draw exploded assemblies.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed assignments per ANSI standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP IX: DRAWING INTERSECTIONS AND DEVELOPMENTS

Time Allotted: 3 weeks

Lab Status: Closed

Number of New Competencies: 5

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will create drawings of the surface developments, transitions, and intersections of various geometric shapes, draw welding symbols, and construct development models to ANSI standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

H-1. Draw surface developments.

H-2. Draw transitions.

H-3. Draw intersections.

H-4. Draw welding symbols.

H-5. Construct development models.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment
6. Construction materials (tape, staples, glue, scissors, utility knife, and construction media)

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

6. Require students to check final patterns by creating models.

7. Demand that students handle knives and scissors carefully.

8. Require all cutting to be done on an appropriate cutting surface; a drafting table is not an appropriate surface.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed assignments per ANSI standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

6. Evaluate models for accuracy and fit.

LAB INSTRUCTIONAL GROUP X: DEVELOPING BASIC CAD SKILLS

Time Allotted: 5 weeks

Lab Status: Closed

Number of New Competencies: 13

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will perform fundamental operating system and program functions to produce basic drawings to ANSI standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

I-1. Review computer program start-up procedures.

I-2. Format disk.

I-3. Copy files.

I-4. Erase files.

I-5. Change directory.

I-6. Rename files.

I-7. Set drawing parameters.

I-8. Create drawing entities.

I-9. Edit drawing entities.

I-10. Control viewing.

I-11. Use drawing aids.

I-12. Save drawing files.

I-13. Plot or print a drawing.

Equipment, Tools, Materials, and Supplies Needed

1. CAD station with access to output device
2. Sample parts and drawings
3. ANSI drafting standards
4. Media and pens
5. Diskettes
6. Reference materials

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.
2. Demonstrate competencies to students before they begin their assignments.
3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.
4. List competencies on a chart and check off each student's progress.
5. Assign two students per work station in order to maximize functional capabilities.
6. Design a rotation schedule so that all students will have equal opportunity to practice competencies.

Evaluation Strategies

1. Observe for safe practices.
2. Maintain student progress chart.
3. Observe students practicing competencies.
4. Evaluate completed assignments per ANSI standards.
5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP XI: DEVELOPING AND REINFORCING COMPETENCIES

Time Allotted: 2 weeks

Lab Status: Semi-open

Number of New Competencies: 0

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will complete, per predetermined specifications, projects that use competencies acquired in the junior year.

Competencies Demonstrated and Practiced in This Lab Instructional Group

All competencies from Instructional Group VIII through X.

Suggested Management Strategies

1. Encourage observation and participation in related trade areas, such as machine trades, carpentry, and welding.
2. Ask the advisory committee for appropriate samples or drawings to be used as assignments.
3. Ask students to provide parts suitable for drawing.
4. Solicit sample work from other vocational programs to be used as assignments.
5. Encourage group projects.
6. Require students to keep areas clean and organized and to follow demonstrated safety practices.
7. Require students to run a copy to check neatness, line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

Evaluation Strategies

1. Observe for safe practices.

2. Observe students practicing competencies.

3. Evaluate completed assignments per ANSI standards.

4. Evaluate completed assignments per predetermined quality and quantity standards.

DRAFTING LAB - SENIOR YEAR

ORGANIZATIONAL CHART - SENIOR YEAR

INSTRUCTIONAL GROUP NO.	NO. OF WEEKS	INSTRUCTIONAL GROUP TITLE	NO. OF COMPETENCIES	LAB STATUS
XII	2	REVIEWING JUNIOR YEAR	0	CLOSED
XIII	2	DEVELOPING INTERMEDIATE CAD SKILLS	9	CLOSED
XIV	6	PREPARING MACHINE DRAWINGS	8	CLOSED
XV	1	DEVELOPING AND REINFORCING COMPETENCIES	0	SEMI-OPEN
XVI	8	PREPARING ARCHITECTURAL DRAWINGS	11	CLOSED
XVII	1	DEVELOPING AND REINFORCING COMPETENCIES	0	SEMI-OPEN
XVIII	4	PREPARING STRUCTURAL DRAWINGS	4	CLOSED
XIX	2	DEVELOPING AND REINFORCING COMPETENCIES	0	OPEN
XX	2	MAPPING	4	CLOSED
XXI	2	SURVEYING	6	CLOSED
XXII	3	PREPARING ELECTRICAL AND ELECTRONIC DRAWINGS	5	CLOSED
XXIII	3	DEVELOPING AND REINFORCING COMPETENCIES	0	SEMI-OPEN

LAB INSTRUCTIONAL GROUP XII: REVIEWING JUNIOR YEAR

Time Allotted: 2 weeks

Lab Status: Closed

Number of New Competencies: 0

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will demonstrate retention of junior-year competencies by satisfactorily completing pretests.

Competencies Demonstrated and Practiced in This Lab Instructional Group

All competencies from Instructional Groups I through XI.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Provide all the necessary forms for senior orientation.
2. Test students for retention of the competencies mastered in the junior year.
3. Review and reinforce competencies presented in the junior year.

Evaluation Strategies

1. Observe for safe practices.
2. Maintain student progress chart.
3. Observe students practicing competencies.
4. Evaluate completed assignments per ANSI standards.
5. Administer a competency test to assess student retention of competencies learned during the junior year.

LAB INSTRUCTIONAL GROUP XIII: DEVELOPING INTERMEDIATE CAD SKILLS

Time Allotted: 2 weeks

Lab Status: Closed

Number of New Competencies: 9

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will perform intermediate CAD functions to produce drawings to ANSI standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

J-1. Develop symbols.

J-2. Develop symbol libraries.

J-3. Manage and control symbols, layers, and line types.

J-4. Manage an operating system.

J-5. Develop drawings requiring intermediate CAD functions.

J-6. Develop attributes.

J-7. Use third party software.

J-8. Use Macro Lisp capabilities.

J-9. Develop three dimensional drawings.

Equipment, Tools, Materials, and Supplies Needed

1. CAD station with access to output device
2. Sample parts and drawings
3. ANSI drafting standards
4. Media and pens
5. Diskettes

6. Reference materials

Suggested Management Strategies

1. Encourage observation and participation in related trade areas, such as machine trades, carpentry, and welding.

2. Ask the advisory committee for appropriate samples or drawings to be used as assignments.

3. Ask students to provide parts suitable for drawing.

4. Solicit sample work from other vocational programs to be used as assignments.

5. Encourage group projects.

6. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

7. Require students to run a copy to check neatness, line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

Evaluation Strategies

1. Observe for safe practices.

2. Observe students practicing competencies.

3. Evaluate completed assignments per ANSI standards.

4. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP XIV: PREPARING MACHINE DRAWINGS

Time Allotted: 6 weeks

Lab Status: Closed

Number of New Competencies: 8

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will draw a variety of parts, assemblies, and layouts.

Competencies Demonstrated and Practiced in This Lab Instructional Group

K-1. Apply tolerances and fits.

K-2. Apply geometric tolerances.

K-3. Draw assemblies.

K-4. Check drawing.

K-5. Draw fasteners.

K-6. Develop fluid-power drawings.

K-7. Develop layouts.

K-8. Develop CAM and gear drawings.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List each competency on a progress chart for check-off upon successful completion by each student.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed assignments per ANSI standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP XV: DEVELOPING AND REINFORCING COMPETENCIES

Time Allotted: 1 week

Lab Status: Semi-open

Number of New Competencies: 0

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will complete to predetermined specifications projects that use competencies requiring both manual and computer skills.

Competencies Demonstrated and Practiced in This Lab Instructional Group

All competencies from Instructional Groups XIII and XIV.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Provide projects that reinforce competencies pertaining to the development of machine drawings and that use both manual and computer skills.
2. Ask students to provide a checking copy from the computer output device and/or to run a copy to check line weights, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

3. Ask the advisory committee for appropriate samples or drawings to be used as assignments.

4. Ask students to provide parts suitable for drawing.

5. Solicit sample work from other vocational programs and use it in assignments.

6. Encourage group projects.

7. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

Evaluation Strategies

1. Observe for safe practices.

2. Observe students practicing competencies.

3. Evaluate completed assignments per ANSI standards.

4. Evaluate completed assignments per predetermined quality and quantity standards.

66

LAB INSTRUCTIONAL GROUP XVI: PREPARING ARCHITECTURAL DRAWINGS

Time Allotted: 8 weeks

Lab Status: Closed

Number of New Competencies: 11

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will produce a set of drawings for residential buildings that meet local building codes.

Competencies Demonstrated and Practiced in This Lab Instructional Group

L-1. Draw a floor plan.

L-2. Draw a plot plan.

L-3. Draw a foundation plan.

L-4. Draw elevations.

L-5. Develop schedules.

L-6. Draw sections and details.

L-7. Draw a roof plan.

L-8. Draw an electrical plan.

L-9. Draw an HVAC plan.

L-10. Draw a plumbing plan.

L-11. Write specifications.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit

2. Drafting media

3. ANSI drafting standards

4. Sample parts, drawings, and sketches

5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List each competency on a progress chart for check-off upon successful completion by each student.

6. Arrange field trips to construction sites.

7. Assure that designs used in this group are practical. Long spans, extreme cantilevers, indoor pools, houses larger than 2500 square feet, and other atypical designs should be considered impractical.

8. Include architectural style (line work, lettering, etc.) as an integral part of this instructional group.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed job assignments per local building codes.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP XVII: DEVELOPING AND REINFORCING COMPETENCIES

Time Allotted: 1 week

Lab Status: Semi-open

Number of New Competencies: 0

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will complete architectural projects that meet predetermined specifications.

Competencies Demonstrated and Practiced in This Lab Instructional Group

All competencies from Instructional Groups XIII through XVI.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI drafting standards
4. Sample models, drawings, and sketches
5. Reproduction equipment
6. Construction materials (tape, staples, glue, scissors, utility knife, and construction media)

Suggested Management Strategies

1. Introduce special projects. Some projects to consider are
   (a) Houses designed by students
   (b) Custom homes (from outside sources)
   (c) Garages, barns, and pole buildings
   (d) Multifamily units (use of CAD system)
   (e) Architectural models

2. Reinforce all competencies presented up to this point.

Evaluation Strategies

1. Observe for safe practices.
2. Maintain student progress chart.
3. Observe students practicing competencies.
4. Evaluate completed job assignments per local building codes.
5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP XVIII: PREPARING STRUCTURAL DRAWINGS

Time Allotted: 4 weeks

Lab Status: Closed

Number of New Competencies: 4

Instructional Group Objective: Given the necessary equipment, tools, materials, and instructions (including all safety precautions), the student will generate structural drawings to AISC standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

M-1. Draw structural steel shapes.

M-2. Draw structural connections.

M-3. Draw erection plans.

M-4. Draw structural details.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. AISC dratting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

6. Arrange a class trip to a field site to observe the procedures used in fabricating steel structures.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students, practicing competencies.

4. Evaluate completed job assignments per AISC standards

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP XIX: DEVELOPING AND REINFORCING COMPETENCIES

Time Allotted: 2 weeks

Lab Status: Open

Number of New Competencies: 0

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will complete to predetermined specifications projects that use competencies requiring both manual and computer skills.

Competencies Demonstrated and Practiced in This Lab Instructional Group

All competencies from Instructional Groups XIII through XVIII.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. AISC drafting standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Provide projects that reinforce competencies pertaining to the development of structural drawings, and that use both manual and computer skills.
2. Have students provide a checking copy from the computer output device for grading.

3. Require students who have prepared a manual drawing to run a copy to check for line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

4. Ask the advisory committee for appropriate samples or drawings to use as assignments.

5. Ask students to provide parts suitable for drawing.

6. Solicit sample work from other vocational programs and use it in assignments.

7. Encourage group projects.

8. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

9. Require students to run a copy to check neatness, line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

Evaluation Strategies

1. Observe for safe practices.

2. Observe students practicing competencies.

3. Evaluate completed assignments per ANSI standards.

4. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP XX: MAPPING

Time Allotted: 2 weeks

Lab Status: Closed

Number of New Competencies: 4

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will demonstrate basic mapping techniques per State of Ohio Plat Standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

N-1. Draw topographic maps.

N-2. Draw mapping symbols.

N-3. Draw mapping profiles.

N-4. Draw site plans.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. State of Ohio Plat Standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed job assignments per state plat standards.

76

LAB INSTRUCTIONAL GROUP XXI: SURVEYING

Time Allotted: 2 weeks

Lab Status: Closed

Number of New Competencies: 6

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will set up, shoot, and operate a transit, and use field notes and sketches to generate a complete drawing per State of Ohio Plat Standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

O-1. Gather data, information, and drawings from county mapping department.

O-2. Set up a transit.

O-3. Operate a transit.

O-4. Shoot boundary lines.

O-5. Make a sketch and take field notes.

O-6. Generate a completed survey drawing.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Dratting station and tool kit

2. Dratting media

3. State plat standards

4. Sample maps, drawings, and sketches

5. Reproduction equipment

6. Transit

7. Surveyor's pole

8. Surveyor's pins, stakes, and hammer

9. Metal detector

10. Clipboard and field notebook

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List competencies on a chart and check off each student's progress.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed job assignments per state plat standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP XXII: PREPARING ELECTRICAL AND ELECTRONIC DRAWINGS

Time Allotted: 3 weeks

Lab Status: Closed

Number of New Competencies: 5

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instructions (including all safety precautions), the student will draw electrical/electronic drawings to ANSI standards.

Competencies Demonstrated and Practiced in This Lab Instructional Group

P-1. Draw pictorial diagrams.

P-2. Draw connection diagrams.

P-3. Draw schematic diagrams.

P-4. Draw printed circuit (PC) drawings.

P-5. Draw block and logic diagrams.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI Drafting Standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment
6. Tape for printed circuit board drawings

Suggested Management Strategies

1. Require students to review definitions, terms, and procedures from the lessons immediately preceding this instructional group.

2. Demonstrate competencies to students before they begin their assignments.

3. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

4. Require students to run a copy to check line weight, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

5. List each competency on a chart and check off each student's progress.

6. Arrange a class trip to a field site to observe the procedures followed in the use and design of electrical and electronic equipment.

Evaluation Strategies

1. Observe for safe practices.

2. Maintain student progress chart.

3. Observe students practicing competencies.

4. Evaluate completed assignments per ANSI standards.

5. Evaluate completed assignments per predetermined quality and quantity standards.

LAB INSTRUCTIONAL GROUP XXIII: DEVELOPING AND REINFORCING COMPETENCIES

Time Allotted: 3 weeks

Lab Status: Open

Number of New Competencies: 0

Instructional Group Objective: Given the necessary equipment, tools, materials, supplies, and instruction (including all safety precautions), the student will complete projects that use competencies requiring both manual and computer skills to complete projects per predetermined specifications.

Competencies Demonstrated and Practiced in This Lab Instructional Group

All competencies from Instructional Groups XIII through XXII.

Equipment, Tools, Materials, and Supplies Needed

1. (A) CAD station with access to output device
   or
   (B) Drafting station and tool kit
2. Drafting media
3. ANSI Drafting Standards
4. Sample parts, drawings, and sketches
5. Reproduction equipment
6. Tape for printed circuit board drawings

Suggested Management Strategies

1. Provide projects that reinforce the development of competencies in mapping, surveying, and electrical and electronic drawing.

2. Require students to provide a checking copy from the computer output device and/or to run a copy to check line weights, lettering, accuracy, and completeness before they submit a drawing and a corrected copy for grading.

3. Ask the advisory committee for appropriate samples or drawings to be used as assignments.

4. Ask students to provide parts suitable for drawing.

5. Solicit sample work from other vocational programs to be used as assignments.

6. Encourage group projects.

7. Require students to keep all work areas clean and organized and to follow demonstrated safety practices.

Evaluation Strategies

1. Observe for safe practices.

2. Observe students practicing competencies.

3. Evaluate completed assignments per ANSI standards.

4. Evaluate completed assignments per predetermined quality and quantity standards.

APPENDIX

Progress charts are used to record each student's progress through the individual assignments in each competency. A **Master Form** is included in this manual for the drafting instructor to reproduce. Sample progress charts for **Instructional Group II, Developing Basic Lab Skills**, and **Instructional Group III, Geometric Construction**, are also included. On the sample progress charts, blank spaces are provided for additional assignments of the instructor's choosing. It is important that the instructor log on a progress chart all individual assignments for each instructional group. The progress chart should reflect progress only, not grades. Furthermore, it should be posted in an area where students who have a need to see it can have access.

Appendix A

DRAFTING LAB PROGRESS CHART, INSTRUCTIONAL GROUP II:
DEVELOPING BASIC LAB SKILLS

DRAFTING LAB PROGRESS CHART

INSTRUCTIONAL GROUP : II DEVELOPING BASIC LAB SKILLS

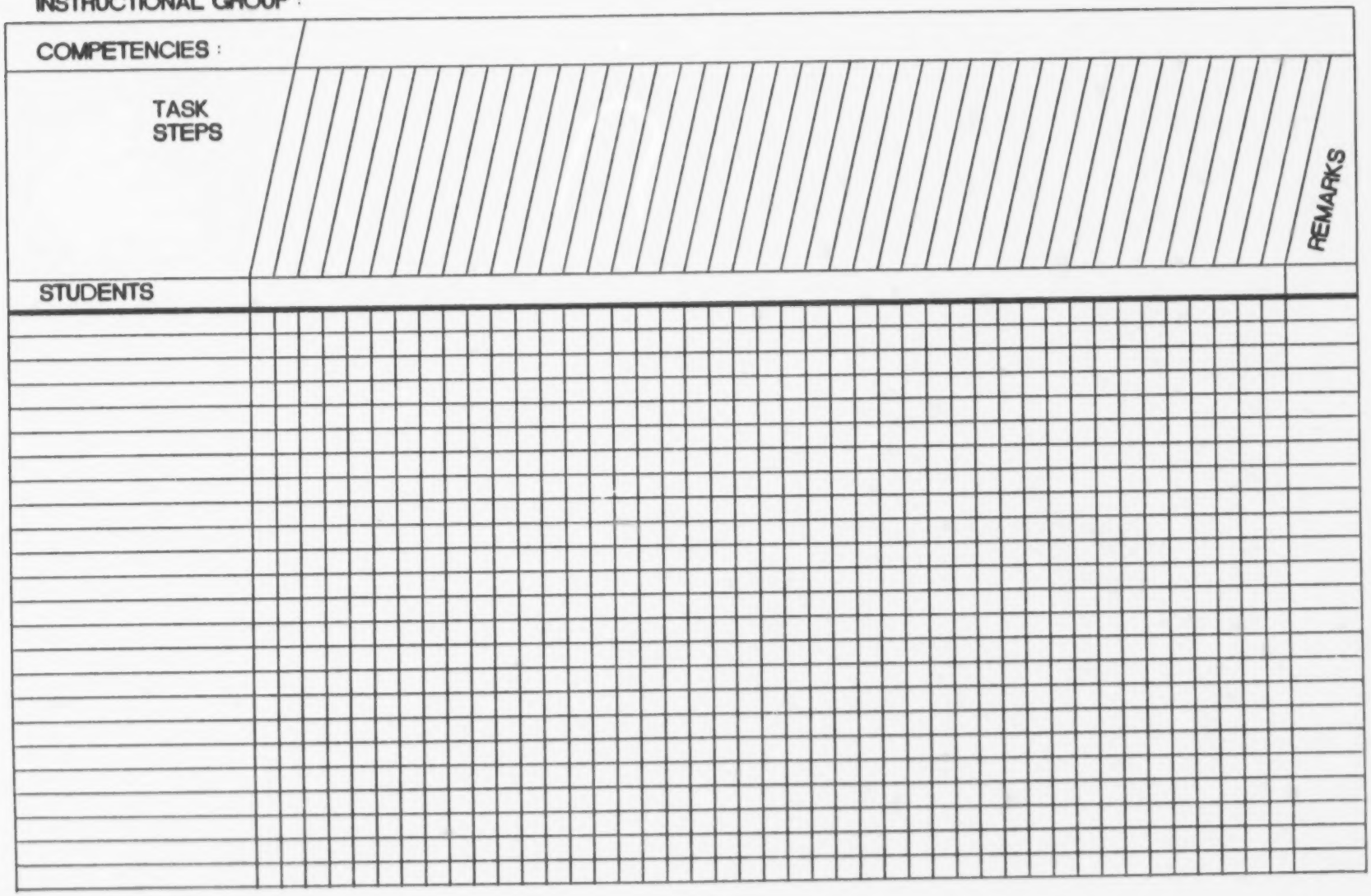
COMPETENCIES :	DEMO USE OF EQUIPMENT										DEMO DWG. REPO.										EXECUTE LETTERING			EXECUTE LINE TECH.			DRAW BORDER /TITLE										
ASSIGNMENTS	ADJUST TABLE	ADJUST MACHINE	STORAGE FILES	LIBRARY USE	DRAFTING EQUIP.						COPY MACHINE	DEMO COPIES	COPY MAT'L STOR.								INCLINE LETTERING	VERTICAL LETTERING	INK LETTERING	LINE WEIGHT PRACTICE	OBJECT LINES	CONSTRUCTION LINES	BORDER & TITLE BLOCK	ASSY & MAT'L BLOCK									REMARKS
STUDENT	LIST OF TASK DUTIES																																				

Appendix B

DRAFTING LAB PROGRESS CHART, INSTRUCTIONAL GROUP III:
DEVELOPING GEOMETRIC CONSTRUCTIONS

DRAFTING LAB PROGRESS CHART

INSTRUCTIONAL GROUP :



Appendix C

DRAFTING LAB PROGRESS CHART (Blank)

DRAFTING LAB PROGRESS CHART

INSTRUCTIONAL GROUP : III DRAWING GEOMETRIC CONSTRUCTIONS

COMPETENCIES :	DRAW LINES				CONSTRUCT ANGLES				CONSTRUCT PLANE FIGUERS				CONSTRUCT CIRCLES & ARCS				CONSTRUCT IRREGULAR FIGURES												
ASSIGNMENTS	PARALLEL LINES	PERPENDICULAR LINES	INTERSECTING LINES	BISECT LINES	RIGHT ANGLES	ACUTE ANGLES	OBTUSE ANGLES	BISECT ANGLES	TRIANGLES	QUADRILATERALS	POLYGONS	CONCENTRIC CIRCLES	ECCENTRIC CIRCLES	TANGENT CIRCLES	TANGENT ARCS	OGEE CURVES	CONIC SECTIONS	ELLIPSES	PARABOLAS	SPIRAL	HELIX	INVOLUTES	CYCLOIDS						REMARKS
STUDENT	LIST OF TASK DUTIES																												